filtered by a perceptual weighting synthesis filter 607 to generate a synthesized signal p(t,n). The adaptive vector q(t,n) by which an error between this synthesized signal p(t,n) and a target signal r(n) obtained by filtering an input speech signal through a perceptual weighting filter 608 becomes minimum is searched. This equals to searching for the adaptive vector q(t,n) that the result of the equation (29) becomes maximum.

$$cntb(t) = \frac{\left(\sum_{n=0}^{NSF-1} r(n)p(t,n)\right)^2}{\sum_{n=0}^{NSF-1} p(t,n)^2} \quad \ldots (29$$

Of all the candidates of the pitch period t included in the search range, the pitch period t corresponding to the maximum contribution degree cntb(t) is set as a subframe pitch period ST(0), and a value obtained by subtracting a predicted subframe pitch period STP(0) from the subframe pitch period ST(0) is set as a relative pitch period $\Delta T(0)$. Processing of obtaining this relative pitch period $\Delta T(0)$ is performed for all subframes sf(k) to obtain relative pitch periods $\Delta T(k)$ of all the subframes.

Finally, the information of the pitch period T(0) obtained by the pitch period analysis section 603 is output from an output terminal 612. The information of the relative pitch period $\Delta T(k)$ corresponding to the

selected.

This embodiment has the following effects.

Assume that relative pitch periods $\Delta T(k)$ are scalar-quantized in units of subframes. In this case, for example, if a search range NR = 8, three bits are required to express each pitch period, as described above. That is, 3 bits × 4 subframes = 12 bits are required per frame to express the information of the relative pitch period $\Delta T(k)$.

In contrast to this, this embodiment has the relative pitch pattern codebook 905 having relative pitch period patterns with high frequencies of appearance as relative pitch patterns. Assume that one vector (four dimensions) is expressed by relative pitch periods $\Delta T(0)$ to $\Delta T(3)$ of four subframes sf(0) to sf(3), and the relative pitch pattern codebook 905 is constituted by 128 (7 bits) types of relative pitch patterns. In this case, the relative pitch periods $\Delta T(k)$ of four subframes can be expressed by 7 bits, which have been expressed by 12 bits. That is, a great reduction in the number of bits can be attained.

The relative pitch pattern codebook 905 has J types of representative relative pitch patterns pv(j) given in advance by:

$$pv(j) = \{v(j, k);\ k = 0 \text{ to } k-1\} \quad (0 \leqq j \leqq J-1) \qquad \ldots (31)$$

An adder 913 adds a predicted subframe pitch period STP(k) and the jth relative pitch pattern pv(j)